

# Vladimir N. Temlyakov

Department of Mathematics,  
University of South Carolina, Columbia, SC 29208

## 1 Education

1976 M.S. Moscow Institute of Physics and Technology  
1978 Ph.D. Steklov Institute of Mathematics  
1981 Dr. Hab. Steklov Institute of Mathematics

## 2 Professional Experience

2007-present USC, Dept. of Mathematics, Carolina Distinguished Professor  
2018-present Lomonosov Moscow State University, Leading scientist  
1995-2007 USC, Dept. of Mathematics, Professor  
1992-1995 USC, Dept. of Mathematics, Associate Professor  
1992-present Steklov Institute of Mathematics, Associate member  
1986-1992 Steklov Institute of Mathematics, Leading Scientist  
1986-1992 Moscow Inst. of Physics and Technology, Professor (part-time position)  
1978-1986 Steklov Institute of Mathematics, Scientist  
1979-1986 Moscow Inst. of Physics and Technology, Assistant, Associate Professor (part-time position)

## 3 Honors and Awards

Gold Medal for Best Student Paper in USSR, 1976.  
Outstanding Publication Award: Steklov Institute (Moscow, USSR), 1979, 1982, 1986, 1998.  
Outstanding Publication Award: Soviet Academy of Science, 1989.

Silver Medal in the Exhibition of the National Economic Achievement, 1989.

Premium for Research in Mathematics, Soviet Academy of Science, 1990.  
Best Paper Award from J. Complexity, 1998, 2012.

Invited Hour Speaker, American Mathematical Society, Birmingham, AL, November 12, 2000.

USC Educational Foundation Award for Research in Science, Mathematics and Engineering, 2003.

Invited Hour Speaker, Foundations of Computational Mathematics, Santander, Spain, July 8, 2005.

Invited Hour Speaker, Curves and Surfaces, Avignon, France, June 29, 2006.

Invited forty-five minutes lecture in the section Analysis of the International Congress of Mathematicians, Madrid, Spain, August 2006.

Carolina Distinguished Professor, August 15, 2007. Reappointed in 2012 and 2017.

Invitation to visit the Institute for Mathematics and its Applications to participate in the year program on Mathematics of Informatics, Spring semester of 2012.

My paper: (with D. Donoho and M. Elad) "Stable recovery of sparse overcomplete representations in the presence of noise", IEEE Transactions on Information Theory **52** (2006), 6–18, has been named "Classic Paper in Information Theory" by Google Scholar. Here is their criterion: "Classic papers are highly-cited papers in their area of research that have stood the test of time. For each area, we list the ten most-cited articles that were published ten years earlier." My paper with 1921 citations is the number 7 in the list, after classical papers on compressed sensing.

## 4 Editing and Refereeing

Member, Editorial Board of Constructive Approximation, Editorial Board of Journal of Approximation Theory, Editorial Board of Journal of Fourier Analysis and Applications. Guest Editor for the Special Issue for Matrix Functions and Sparse Approximate Solution of Linear Systems of the journal Linear Algebra and its Applications. Referee for 10 professional journals.

## 5 Major Service to the University of South Carolina

Assessment Committee, 2010-2011,  
Grant Mentoring Committee, 2010-present,  
Peer Review of Teaching Committee, subcommittee F1 (chair), 2008-2011, subcommittee F2, 2011-present;  
University Committee on Named and Distinguished Professorships, 2007-2010;  
Faculty Grievance Committee, 2008-2009.  
University Committee on Tenure and Promotion, 2004-2007;  
University Award Committee for Research in Science, Mathematics and Engineering, 2004-2007;  
Committee of Tenured Full Professors Chair, 1996; 2017–present;  
Hiring Committee, 1995-1996; 1999-2000; 2001-2002; 2002-2003 (chair); 2007-2008;  
IMI Executive Committee, 1998-2002; 2005-2009;  
Colloquium Talks Committee Chair, 1994-1995;  
Candidacy Examination Chair, 1993, 1996;  
Physical Facilities, 1992-2003;  
Undergraduate Adviser, 1992-1999;

## 6 Major Professional Service

Chair of the Organizing Committee of International Conference on Approximation and Computation (celebrating the 60<sup>th</sup> birthday of Ron DeVore), Charleston, South Carolina, May 12–17, 2001.

Organizer of Special Sessions of the AMS Meetings: Nonlinear Approximation, Birmingham, AL, November 10–12, 2000; Approximation and Wavelets, Columbia, SC, March, 16–18, 2001.

Organizer of Minisymposiums: Nonlinear Approximation, Fourth International Conference on Curves and Surfaces, July 1–7, 1999, Saint-Malo, France; Nonlinear Approximation, SIAM Annual Meeting 2000, Puerto Rico, July 10–14, 2000; Greedy Approximation, Fifth International Conference on Curves and Surfaces, Saint-Malo, France, June 27 – July 3, 2002; Learning Theory, 13th International conference on Approximation Theory, San Antonio, Texas, March 4–8, 2007.

Member of the Organizing or Programming Committee: International Conference on Harmonic Analysis and Approximations, Ambert, Armenia, September, 1998; International Conference on Approximation Theory, May 25–30, 1999, Kiev, Ukraine; International Conference on Harmonic Analysis and Approximations, Ambert, Armenia, September 11–18, 2001; International Conference on Differential Equations and Approximation Theory, Hanoi, Vietnam, December 10–15, 2001; Workshop on Nonlinear Approximations in Numerical Analysis, Moscow, June 22–25, 2003; International conference on Theory of Functions (celebrating the 100<sup>th</sup> birthday of S.M. Nikol’skii), Moscow, May 24–30, 2005; International conference on Analysis and Computations (celebrating the 60<sup>th</sup> birthday of N.Temirgaliev, Astana, Kazakhstan, June 5–9, 2007). International conference on Harmonic Analysis and Approximations, V, Tsaghadzor, Armenia, September 10–17, 2011. Research Semester on Approximation Theory and Fourier Analysis, Barcelona, Spain, September 1 – December 31, 2011. Organizer of the Workshop on Discrepancy, Numerical Integration and Hyperbolic Cross Approximation, Hausdorff-Center for Mathematics, University of Bonn, September 23–27, 2013. Organizer of the ICERM semester on High-dimensional Approximation, September 8, 2014 – December 5, 2014, Providence, RI. Organizer of the Workshop CMO-BIRS on Applied Functional Analysis Oaxaca, Mexico, June 28–July 3, 2015. Conference ”Harmonic analysis and Approximations”, Armenia, September 12-18, 2015. Member of the Programming Committee. Organizer of a research semester on Approximation and Harmonic Analysis at the Centre de Recerca Matematica, Barcelona, Spain, March–July, 2016.

Very recently our proposal for organizing a semester at the Isaak Newton Institute, Cambridge, UK, was approved (<http://www.newton.ac.uk/event/asc>). It is a six months (3 January 2019 – 28 June 2019) semester ”Approximation, sampling and compression in data sciences”, organized by Anders Hansen (University of Cambridge), Alexei Shadrin (University of Cambridge), Vladimir Temlyakov (University of South Carolina), Sergey Tikhonov (CRM, Barcelona, Spain).

## 7 Supervision of Graduate Students

Master’s Students:

Alexander Pavlov, 1986;  
Vladimir Dubinin, 1990;

Valerii Razgonyaev, 1993;  
 Grace Brown, 2012.  
 Doctoral Students:  
 Alexander Pavlov, Absolute summation of Fourier series by subsequences, MIAN, 1989;  
 Nikolai Pustovoitov, The multidimensional Jackson theorem in  $L_p$ , MIAN, 1992;  
 Vladimir Dubinin, Greedy algorithms and applications, USC, 1996;  
 Alexander Andrianov, Non-linear approximation of some multivariate classes of functions, USC, 2000;  
 Xiteng Liu, Sparse Signal Representation in Redundant Systems, USC, 2006;  
 Daniel Savu, Sparse Approximation In Banach Spaces, USC, 2009;  
 Pavel Zheltov, Additive Lebesgue-Type Inequalities for Greedy Approximation, USC, 2010;  
 Entao Liu, Super Greedy Type Algorithms and Applications In Compressed Sensing, USC, 2011;  
 Mingrui Yang, Greedy Algorithms In Approximation Theory and Compressed Sensing, USC, 2011;  
 Jessica Nelson, Greedy Algorithms and Incoherent Systems, USC, 2011;  
 Rui Yu, Fibonacci Sets In Discrepancy Theory and Numerical Integration, USC, 2012;  
 Anton Dereventsov, Convergence and rate of convergence of approximate greedy-type algorithms, USC, 2017.

## 8 Recent Collaborators

Dr. D. Bilyk, University of Minnesota, USA;  
 Dr. P. Binev, University of South Carolina, USA;  
 Dr. A. Cohen, University Paris VI, France;  
 Dr. W. Dahmen, RWTH Aachen, Germany, Constructive Approximation;  
 Dr. R.A. DeVore, Texas A&M University, USA;  
 Dr. D.L. Donoho, Stanford University, USA;  
 Dr. Dinh Dung, Vietnam Institute for Advanced Study in Mathematics, Vietnam;  
 Dr. M. Elad, Technion, Israel;

Dr. H. G. Feichtinger, University of Vienna, Austria, The Journal of Fourier Analysis and Applications;  
Dr. B.S. Kashin, Steklov Institute of Mathematics, Russia;  
Dr. K. Kazarian, University Autonoma de Madrid, Spain;  
Dr. G. Kerkyacharian, University Paris X, France;  
Dr. S.V. Konyagin, Moscow State University, Russia;  
E. Liu, Georgia Tech., USA;  
E. Livshitz, Moscow State University, Russia;  
Dr. J. Nelson, Newberry College, USA;  
Dr. P. Nevai, The Ohio State University, USA, Journal of Approximation Theory;  
Dr. D. Picard, University Paris VII, France;  
Dr. T. Ullrich, University of Bonn, Germany.

## 9 Grant Support

1. NSF, Multivariate approximation, PI: V. Temlyakov, 5/16/96–5/15/99, \$64,668.00.
2. DOD/EPSCoR, Wavelet Based on Image Processing for Military and Commercial, PI: R.A. DeVore, 6/1/96–5/31/99, \$515,047.00.
3. ONR, Highly Nonlinear Algorithms for Wavelet Based Image Processing with Military Applications, PI: R.A. DeVore, 11/14/97–11/13/00, \$583,000.00.
4. NSF, Algorithms in Nonlinear Approximation, PI: V. Temlyakov, 5/15/99–5/15/02, \$82,328.00.
5. DOD/DEPSCoR, Advanced Wavelet Methods for Image and Signal Processing, PI: R.A. DeVore, 3/15/99–3/14/02.
6. NSF, Greedy Approximation, PI: V.N. Temlyakov, 7/01/02–6/30/03, \$33,500.
7. NSF, Greedy Approximation, PI: V.N. Temlyakov, 7/01/03–6/30/04, \$34,499.
8. NSF, Greedy Approximation, PI: V.N. Temlyakov, 7/01/04–6/30/05, \$35,501.
9. DOD/EPSCoR, Nonlinear Methods for Supervised Learning: Defense Applications, PI: R.A. DeVore and V.N. Temlyakov, 7/01/05–6/30/08, \$700,000.

10. NSF, Greedy Approximations and Expansions, PI: V.N. Temlyakov, 6/30/06–6/29/09, \$116,917.
11. NSF, Application of Greedy Approximations in Numerical Integration and Learning Theory, PI: V.N. Temlyakov, 2009–2012, \$196,567.
12. NSF Grant, CMG COLLABORATIVE RESEARCH: Advanced Computational Models for Geological Storage of Carbon Dioxide, 2009–2013, 300,000.00 (with A. Celia and Hong Wang).
13. NSF Grant, Greedy Approximation in Banach Spaces and Compressed Sensing, PI: V.N. Temlyakov, \$196,452, Period: 07/01/12 – 06/30/15.
14. NSF travel grant, "Constructive Approximation and Harmonic Analysis", \$26,298.00, Period 03/02/2016–03/01/2017.
15. The Russian Federation Government Grant No. 14.W03.31.0031, "High dimensional approximation, recovery, and compression with applications in Big Data analysis", PI: V.N. Temlyakov, \$1,000,000.00, Period 01/01/2018–12/31/2020.

## 10 Books

1. Approximation of Functions with Bounded Mixed Derivative, Proc. Steklov Inst. Math., 1989, No. 1, pgs. 1-122.
2. Approximation of Periodic Functions Nova Science Publishers, Inc., 1993, 302 pgs.
3. Greedy Approximation, Cambridge University Press, 2011, 418 pgs.
4. Sparse Approximation with Bases, Advanced Courses in Mathematics CRM Barcelona, Birkhäuser, 2015, 270 pgs.
5. (with Dinh Dung and Tino Ullrich), Hyperbolic Cross Approximation, accepted by Advanced Courses in Mathematics CRM Barcelona, Birkhäuser; arXiv:1601.03978v2 [math.NA] 2 Dec 2016.
6. Multivariate Approximation, Cambridge University Press, 2018, 540 pgs.

## 11 Papers

1. "On Uniqueness of the Polynomial of Best Approximation of the Function  $\cos kx$  by Trigonometric Polynomials in the  $L$  Metric", Math. Notes, 15 (1974), 436-441.

2. "Best Approximations for Functions of Two Variables", Soviet Math. Dokl. 16 (1975), 1051-1055.
3. "On the Asymptotic Behavior of Best Approximations of Continuous Functions", Soviet Math. Dokl. 17 (1976), 739-743.
4. "On Best Approximation of Functions of Two Variables", Analysis Mathematica 2 (1976), 231-234.
5. "Asymptotic Behavior of Best Approximations of Continuous Functions", Math USSR Izvestija 11 (1977), 551-569.
6. "On Localized Approximation of Functions by Trigonometric Polynomials", Analysis Mathematica 3 (1977), 151-169 (in Russian).
7. "Order of Growth of the Degrees of a Polynomial Basis of a Space of Continuous Functions", Math Notes 22 (1977), 888-898.
8. "On the Question of the Asymptotic Behavior of Best Approximations of Continuous Functions", Math USSR Sb. 38 (1981), 365-380.
9. "Approximation of Periodic Functions of Several Variables with Bounded Mixed Derivative", Soviet Math. Dokl. 20 (1979), 1032-1035.
10. "On the Approximation of Periodic Functions of Several Variables with Bounded Mixed Difference", Soviet Math. Dokl. 22 (1980), 131-135.
11. "Approximation of Periodic Functions of Several Variables with Bounded Mixed Differences", Math. USSR Sb. 41 (1982), 53-66.
12. "Approximation of Periodic Functions of Several Variables with Bounded Mixed Derivative", Proc. Steklov Inst. Math. (1983), 255-283.
13. "Relations Between Best Approximations of Functions of Two Variables", Math Notes 29 (1981), 51-58.
14. "Approximation of Functions from the Lipschitz Class by Algebraic Polynomials", Math Notes 29 (1981), 306-309.
15. "Approximation of Continuous Functions by Trigonometric Polynomials", Proc. Steklov Inst. Math. (1983), 213-228.
16. "Widths of Some Classes of Functions of Several Variables", Soviet Math Dokl. 26 (1982), 619-622.
17. "Approximation of Functions with a Bounded Mixed Difference by Trigonometric Polynomials, and the Widths of Some Classes of Functions", Math. USSR Izvestija 20 (1983), 173-187.
18. "On Absolute Summation of Fourier Series by Subsequences", Analysis Math. 8 (1982), 71-77.
19. "On Relations Between Best Approximations of Functions Analytic in the Bidisk", Proc. Stekov Inst. Math. 2 (1985), 217-224.



- 20.** "On the Approximation of Periodic Functions of Several Variables", Soviet Math. Dokl. 30 (1984), 659-662.
- 21.** "On the Approximate Reconstruction of Periodic Functions of Several Variables", Soviet Math. Dokl. 31 (1985), 246-249.
- 22.** "Quadrature formulas and recovery from the values at the knots of number-theoretical nets for classes of functions with small smoothness", Uspekhi Matem. Nauk, 40 (1985), 203-204.
- 23.** "Approximate Recovery of Periodic Functions of Several Variables", Math. USSR Sb. 56 (1987), 249-261.
- 24.** "On the Asymptotic Behavior of Best Approximations of Individual Functions", Proc. Steklov Inst. Math. 3 (1987), 341-352.
- 25.** "Approximation of Periodic Functions of Several Variables by Trigonometric Polynomials, and Widths of Some Classes of Functions", Math. USSR Izvestija 27 (1986), 285-322.
- 26.** "On Best Bilinear Approximations of Periodic Functions of Several Variables", Soviet Math. Dokl. 33 (1986), 96-99.
- 27.** "On Resonstruction of Multivariate Periodic Functions Based on Their Values at the Knots of Number-Theoretical Nets", Analysis Mathematica 12 (1986), 287-305 (in Russian).
- 28.** "Approximation of Periodic Functions of Several Variables by Combinations of Functions Depending on Fewer Variables", Proc. Steklov Inst. Math. 4 (1987), 263-272.
- 29.** "Approximation of Periodic Functions of Several Variables by Bilinear Forms", Math. USSR Izvestija 28 (1987), 133-150.
- 30.** "On Estimates of the Best Bilinear Approximations of Periodic Functions and Singular Numbers of Integral Operators", Proc. Steklov Inst. Math 3 (1989), 252-253.
- 31.** "On Widths of Function Classes", Soviet Math. Dokl. 35 (1987), 636-642.
- 32.** "Estimates of the Best Bilinear Approximations of Functions of Two Variables and Some of Their Applications", Math. USSR Sb. 62 (1989), 95-109.
- 33.** "Best Bilinear Approximation and Connected Questions", Constructive Theory of Functions '87 (1988), 448-454.
- 34.** "On Estimates of  $\epsilon$ -Entropy and Widths of Classes of Functions with Bounded Mixed Derivative or Difference", Soviet Math. Dokl. 38 (1989), 84-87.

- 35.** "Estimates of Best Bilinear Approximation of Periodic Functions", *Steklov Inst. Math.* 4 (1989), 275-293.
- 36.** "Approximation by Elements of a Finite-Dimensional Subspace of Functions from Various Sobolev or Nikol'skii Spaces, *Math Notes* 43 (1988), 444-454.
- 37.** "Error Estimates of Quadrature Formulas for Classes of Functions with Bounded Mixed Derivative", *Math Notes* 46 (1989), 663-668.
- 38.** "Approximation of Functions of Several Variables by Trigonometric Polynomials with Harmonics from Hyperbolic Crosses", *Ukrainian Math. J.* 41 (1989), 451-456.
- 39.** "Bilinear Approximation and Applications", *Proc. Steklov Inst. Math.* 3 (1990), 221-248.
- 40.** "Estimates of the Asymptotic Characteristics of Classes of Functions with Bounded Mixed Derivative or Difference", *Proc. Steklov Inst. Math.* 4 (1990), 161-197.
- 41.** "On a Problem of Estimating Widths of Classes of Infinity Differentiable Functions", *Math Notes* 47 (1990), 155-157.
- 42.** "On Universal Cubature Formulas", *Soviet Math. Dokl* 43 (1991), 39-42.
- 43.** "On a Way of Obtaining Lower Estimates for the Errors of Quadrature Formulas", *Math. USSR Sb.* 71 (1992), 247-257.
- 44.** "On Estimates of Approximation Numbers and Best Bilinear Approximation", *Constructive Approximation* 8 (1992), 23-33.
- 45.** "On the Behavior of the Partial Sums, Over Hyperbolic Crosses, of Fourier Series of Periodic Functions of Several Variables", *Proc. Steklov Inst. Math.* 3 (1992), 209-218.
- 46.** "Estimates of Best Bilinear Approximations of Functions and Approximation Numbers of Integral Operators", *Math. Notes* 51 (1992), 510-517.
- 47.** "Bilinear Approximation and Related Questions", *Proc. Steklov Inst. of Math.*, 4 (1993), 245-265.
- 48.** "Error Estimates for Fibonacci Quadrature Formulas for Classes of Functions with Bounded Mixed Derivative", *Proc. Steklov Inst. of Math.* 2 (1993), 359-367.
- 49.** "Universality of the Fibonacci Cubature Formulas", *Methods of Approximation Theory in Complex Analysis and Mathematical Physics (Leningrad, 1991)*, *Lecture Notes in Math.*, vol. 1550, Springer, Berlin, 1993, pp. 178-184.

**50.** "On Error Estimates for Cubature Formulas", Trudy Mat. Inst. Steklov, V. 207 (1994), 326–338; Proceedings of Steklov Inst. Math. 6(1995), 299–302.

**51.** "On Approximate Recovery of Functions with Bounded Mixed Derivative", J. Complexity 9 (1993), 41–59.

**52.** (with R. A. DeVore) "Nonlinear Approximation by Trigonometric Sums", The Journal of Fourier Analysis and Applications, 2(1995), 29–48.

**53.** (with R. A. DeVore and P. P. Petrushev) "Multivariate Trigonometric Polynomial Approximation with Frequencies from the Hyperbolic Cross", Math Notes, V. 56, No. 3, (1994), 36–63 (in Russian).

**54.** (with R. DeVore) "The role of approximation and smoothness spaces in compression and noise removal", Information Theory and Statistics, 1994. Proceedings., 1994 IEEE-IMS Workshop on Statistics, 52.

**55.** "An Inequality for Trigonometric Polynomials and its Applications for Estimating the Entropy Numbers", J. Complexity, v. 11 (1995), 193–307.

**56.** (with B. S. Kashin) "On the Best  $m$ -Terms Approximation and the Entropy of Sets in the Space  $L_1$ ", Math. Notes, v. 56 (1994), No. 5–6, 1137–1157.

**57.** "Some Inequalities for Multivariate Haar Polynomials", East Journal on Approximations, v. 1 (1995), No. 1, p. 61–72.

**58.** (with R.A. DeVore) "Some Remarks on Greedy Algorithms", Advances in Computational Mathematics, v. 5 (1996), 173–187.

**59.** (with B.S. Kashin) "On Estimating Approximative Characteristics for Classes of Functions with Bounded Mixed Derivative", Math. Notes, v. 58 (1995), No. 6, 922–925.

**60.** "An Inequality for Trigonometric Polynomials and its Application for Estimating the Kolmogorov Widths", East Journal on Approximations, v. 2 (1996), 253–262.

**61.** (with S.A. Telyakovskii) "On Convergence of Fourier Series of Multivariate Functions of Bounded Variation", Math. Notes, v. 61, No. 4 (1997), p. 583–595 (in Russian).

**62.** (with A.A. Andrianov) "On Two Methods of Generalization of Properties of Univariate Function Systems to Their Tensor Product", Proc. Steklov Inst. Math., v. 219 (1997), 25–35.

**63.** (with R.A. DeVore) "Nonlinear Approximation in Finite Dimensional Spaces", J. Complexity, v. 13 (1997), 489–508.

**64.** (with R.A. DeVore and S.V. Konyagin) "Hyperbolic Wavelet Approximation", Constr. Approx., v. 14 (1998), 1–26.

65. "The Best  $m$ -term Approximation and Greedy Algorithms", *Advances in Comp. Math.*, v. 8 (1998), 249–265.
66. "Nonlinear Kolmogorov Widths", *Math. Notes*, v. 63 (1998), 891–902 (in Russian).
67. "Non-linear  $m$ -term Approximation With Regard to The Multivariate Haar System", *East J. Approx.*, v. 4(1998), 87–106.
68. "Greedy Algorithms and  $m$ -term Approximation With Regard to Redundant Dictionaries", *J. Approx. Theory*, 98(1999), 117–145.
69. "Greedy Algorithms With Regard to Multivariate Systems With Special Structure", *Constr. Approx.*, 16(2000), 399–425.
70. (with A.A. Andrianov) "Best  $m$ -term Approximation of functions from classes  $MW_{q,\alpha}^r$ ", *Approximation Theory IX*, 7–14.
71. "On Two Problems in The Multivariate Approximation", *East J. Approx.*, v. 4 (1998), 505–514.
72. "Greedy Algorithm and  $m$ -term Trigonometric Approximation", *Constr. Approx.*, v. 14 (1998), 569–587.
73. (with B.S. Kashin) "On one norm and related applications", *Matem. Zametki*, 64(1998), 637–640 (in Russian).
74. (with B.S. Kashin) "On one norm and approximative characteristics of classes of multivariate functions", in the book "Metric theory of functions and related questions", Moscow, AFC, 1999, 69–99.
75. "Weak greedy algorithms", *Advances in Comp. Math.*, 12(2000), 213–227.
76. (with S.V. Konyagin) "A remark on greedy approximation in Banach spaces", *East J. Approx.* 5(1999), 365–379.
77. "Universal bases and greedy algorithms for anisotropic function classes", *Constructive Approximation* 18(2002), 529–550.
78. (with S.V. Konyagin) "Rate of convergence of Pure Greedy Algorithm", *East J. Approx.* 5(1999), No. 4, 493–499.
79. (with V.E. Maiorov and K.I. Oskolkov) "Gridge approximation and Radon compass", *APPROXIMATION THEORY: A volume dedicated to Blagovest Sendov*, DARBA, Sofia, 2002, 284–309.
80. "Greedy algorithms in Banach spaces", *Advances in Comp. Math.* 14(2001), 277–292.
81. (with E.D. Livshitz) "On the convergence of Weak Greedy Algorithms", *Tr. Mat. Inst. Steklova* 232(2001), 236–247.
82. "A criterion for convergence of Weak Greedy Algorithms", *Advances in Computational Mathematics* 17(2002), 269–280.

- 83.** "Nonlinear methods of approximation", *Found. Comput. Math.* 3(2003), 33–107.
- 84.** (with E.D. Livshitz) "Two lower estimates in Greedy Approximation", *Constr. Approx.* 19(2003), 509–523.
- 85.** (with S.J. Dilworth and D. Kutzarova) "Convergence of some Greedy Algorithms in Banach spaces", *The Journal of Fourier Analysis and Applications* 8(2002), 489–505.
- 86.** "Nonlinear Approximation with regard to bases", *Approximation Theory X*, Vanderbilt University Press, Nashville, TN, 2002, 373–402.
- 87.** (with S.J. Dilworth, N.J. Kalton and D. Kutzarova) "The Thresholding Greedy Algorithm, Greedy Bases, and Duality", *Constr. Approx.* 19(2003), 575–597.
- 88.** (with R. DeVore and G. Petrova) "Best basis selection for approximation in  $L_p$ ", *Found. Comput. Math.* 3(2003), 161–185.
- 89.** "Cubature formulas, discrepancy, and nonlinear approximation", *J. Complexity* 19(2003), 352–391.
- 90.** (with S.V. Konyagin) "Convergence of Greedy Approximation I. General Systems", *Studia Mathematica* 159(1)(2003), 143–160.
- 91.** (with S.V. Konyagin) "Convergence of Greedy Approximation II. The Trigonometric System", *Studia Mathematica* 159(2)(2003), 161–184.
- 92.** (with A. Lutoborski) "Vector Greedy Algorithms", *J. Complexity* 19(2003), 458–473.
- 93.** (with S.V. Konyagin) "Greedy Approximation with Regard to bases and General Minimal Systems", *Serdica Math. J.* 28(2002), 305–328.
- 94.** "Greedy Type Approximations in Banach Spaces and Applications", *Constr. Approx.* 21(2005), 257–292.
- 95.** (with A. Kamont) "Greedy Approximation and the Multivariate Haar system", *Studia Mathematica* 161(3)(2004), 199–223.
- 96.** (with B.S. Kashin) "The volume estimates and their applications", *East J. Approx.* 9(2003), 469–485.
- 97.** "A remark on simultaneous greedy approximation", *East J. Approx.* 10(2004), 17–25.
- 98.** (with S.V. Konyagin) "Some error estimates in Learning Theory", *APPROXIMATION THEORY: A volume dedicated to Borislav Bojanov, Marin Drinov Acad. Publ. House, Sofia, 2004*, 126–144.
- 99.** (with D. Leviatan) "Simultaneous greedy approximation in Banach spaces", *J. Complexity* 21(2005), 275–293.

- 100.** (with S.V. Konyagin) "Convergence of greedy approximation for the trigonometric system", *Analysis Mathematica*, 31(2005), 85–115.
- 101.** "Greedy Algorithms with restricted depth search", *Proceedings of Steklov Inst. Math.* 248(2005), 255–267.
- 102.** (with P. Binev, A. Cohen, W. Dahmen and R. DeVore), "Universal Algorithms for Learning Theory Part I: piecewise constant functions", *J. Machine Learning Research* 6 (2005), 1297-1321.
- 103.** (with R. DeVore, G. Kerkyacharian and D. Picard) "On mathematical methods for supervised learning", *Found. Comp. Math.* 6(2006), 3–58.
- 104.** (with D. Donoho and M. Elad) "Stable recovery of sparse over-complete representations in the presence of noise", *IEEE Transactions on Information Theory* 52(2006), 6–18.
- 105.** "Optimal estimators in Learning Theory", *Approximation and Probability*, Banach Center Publications, Volume 72, Inst. Math. Polish Academy of Sciences, Warsaw, 2006, 341–366.
- 106.** (with G. Kerkyacharian and D. Picard) "Some inequalities for the tensor product of greedy bases and weight-greedy bases", *East J. Approx.* 12(2006), 103–118.
- 107.** "Greedy Approximations", *Foundations of Computational Mathematics*, Santander 2005, London Mathematical Society Lecture Notes Series 331, Cambridge University Press, 2006, 371–394.
- 108.** "Greedy approximations with regard to bases", *Proceedings of the International Congress of Mathematicians*, Madrid, August 22–30, 2006, 1479–1504.
- 109.** (with D. Leviatan) "Simultaneous Approximation by Greedy Algorithms", *Advances in Comput. Math.*, 25(2006), 73–90.
- 110.** (with S.V. Konyagin) "The entropy in Learning Theory. Error estimates", *Constr. Approx.* 25 (2007), 1–27.
- 111.** "Greedy Expansions in Banach Spaces", *Advances in Comput. Math.* 26(2007), 431–449.
- 112.** "Approximation in learning theory", *Constr. Approx.* 27(2008), 33–74.
- 113.** "On universal estimators in learning theory", *Proceedings of the Steklov Inst. Math.* 255(2006), 244-259.
- 114.** (with D. Donoho and M. Elad) "On the Lebesgue type inequalities for greedy approximation", *J. Approximation Theory* 147(2007), 185–195.

- 115.** "Relaxation in greedy approximation", *Constr. Approx.* 28(2008), 1–25.
- 116.** "Greedy algorithms with prescribed coefficients", *J. Fourier Analysis and Applications* 13(2007), 71–86.
- 117.** "Universality in Approximation and Estimation", *Proceedings, Curves and Surfaces VI*, Nashboro Press, Brentwood, TN, 2007.
- 118.** "Greedy Approximation in Banach Spaces", *Proceedings of the conference dedicated to N. Kalton, 60, Banach Spaces and their Applications in Analysis, de Gruyter 2007*, 193–208.
- 119.** (with S.J. Dilworth, Denka Kutzarova, Karen L. Shuman, P. Wojtaszczyk) "Weak Convergence of Greedy Algorithms in Banach Spaces", *J. Fourier Analysis and Applications* 14(2008), 609–628.
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- 125.** (with P. Zheltov) "On performance of greedy algorithms", *J. Approximation Theory*, 2011, Vol. 163, 1134–1145.
- 126.** (with Mingrui Yang and Peixin Ye) "Lebesgue-type inequalities for greedy approximation with respect to quasi-greedy bases", *East J. Approximation*, 2011, Vol 17, 127–138.
- 127.** (with S.V. Konyagin and Yu. V. Malykhin) "On basis sets in Banach spaces", *East J. Approximation*, 2011, Vol 17, 221–226.
- 128.** (with J. Nelson) "On the size of incoherent systems", *J. Approximation Theory*, 2011, Vol 163, 1238–1245.
- 129.** (with E. Liu) "The orthogonal super greedy algorithm and applications in compressed sensing", *IEEE Trans. Inform. Theory*, 58:4 (2012), 2040–2047.
- 130.** (with D. Bilyk and Rui Yu) "Fibonacci sets and symmetrization in discrepancy theory", *J. Complexity*, 28:1 (2012), 18–36.

- 131.** (with Entao Liu) "Super greedy type algorithms", *Adv. Comput. Math.*, 37:4 (2012), 493–504.
- 132.** (with D. Bilyk and Rui Yu) "The  $L_2$ -Discrepancy of Two-Dimensional Lattices", *Recent Advances in Harmonic Analysis and Applications*, Springer Proceedings in Mathematics & Statistics, Volume 25, 2013, 63–77.
- 133.** (with S.J. Dilworth, M. Soto-Bajo) "Quasi-greedy bases and Lebesgue-type inequalities", *Stud. Math.*, 211:1 (2012), 41–69.
- 134.** (with J. L. Nelson) "Greedy expansions in Hilbert Spaces", *Trudy MIAN*, 280 (2013), 234–246.
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- 137.** (with D. Savu) "Lebesgue-type inequalities for greedy approximation in Banach spaces", *IEEE Transactions on Information Theory*, 59 (2013), 1098–1106.
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- 142.** "Incoherent systems and covering in finite dimensional Banach spaces", *Matem. Sbornik*, **205** (2014), 97–116, arXiv:1301.3043v1 [math.MG] 10 Jan 2013; IMI Preprint 2013:01, 1–21.
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- 144.** "Sparse approximation and recovery by greedy algorithms in Banach spaces", *Forum of Mathematics, Sigma*, **2** (2014), e12, 26 pages; arXiv: 1303.6811v1 [stat.ML] 27 Mar 2013.



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- 146.** (with R.A. DeVore), "Convex optimization on Banach spaces", Foundations of Computational Mathematics, 16 (2016), 369–394; arXiv:1401.0334v1, 1 Jan 2014.
- 147.** (with D. Bazarkhanov) "Nonlinear tensor product approximation of functions", arXiv:1409.1403v1 [stat.ML] 4 Sep 2014; J. Complexity, 31 (2015), 867–884.
- 148.** "Convergence and Rate of Convergence of Some Greedy Algorithms in Convex Optimization", Trudy MIAN, **293** (2016), 333–345; English transl. Proceedings of Steklov Institute, **293** (2016), 325–337; arXiv: 1412.3297v1 [stat.ML] 10 Dec 2014.
- 149.** "Incremental Greedy Algorithm and Its Applications in Numerical Integration", Springer Proceedings in Mathematics & Statistics, Monte Carlo and Quasi-Monte Carlo Methods, MCQMC, Leuven, Belgium, April 2014, 557–570.
- 150.** "Constructive sparse trigonometric approximation and other problems for functions with mixed smoothness", arXiv: 1412.8647v1 [math.NA] 24 Dec 2014, 1–37; Matem. Sb., 206 (2015), 131–160.
- 151.** "Lebesgue-type inequalities for greedy approximation", Proceedings of the conference New Trends in Applied Harmonic Analysis, Sparse Representations, Compressed Sensing and Multifractal Analysis, Mar del Plata, Argentina, August 5 - 16, 2013, Birkhäuser, 2016, 107–143.
- 152.** "Constructive sparse trigonometric approximation for functions with small mixed smoothness", Constr. Approx., 45 (2017), 467–495; arXiv:1503.0282v1 [math.NA] 1Mar 2015).
- 153.** "Dictionary descent in optimization", arXiv:1511.01304v1 [stat.ML] 4 Nov 2015; Analysis Mathematica 42 (1) (2016), 69–89.
- 154.** "Sparse approximation by greedy algorithms", Springer Proceedings in Mathematics & Statistics, Mathematical Analysis, Probability and Applications – Plenary Lectures, ISAAC 2015, Macau, China, 183–215; arXiv:1511.01846v1 [math.NA] 5 Nov 2015.
- 155.** "On the entropy numbers of the mixed smoothness function classes", arXiv 1602.08712v1 [math.NA] 28 Feb 2016; J. Approx. Theory, **217** (2017), 26–56.
- 156.** "Greedy Algorithms", Encyclopedia of Applied and Computational

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**157.** (with S. Tikhonov) "Remez-type inequalities for the hyperbolic cross polynomials", arXiv 1606.03773v1 [math.CA] 12 Jun 2016; Constr. Approx., **46** (2017), 593–615.

**158.** "The Marcinkiewicz-type discretization theorems for the hyperbolic cross polynomials", Jaen Journal on Approximation, **9** (2017), No. 1, 37–63; arXiv: 1702.01617v2 [math.NA] 26 May 2017.

**159.** "The Marcinkiewicz-type discretization theorems", submitted to Constructive Approximation; arXiv:1703.03743v1 [math.NA], 10 Mar 2017.

**160.** "Universal discretization", Journal of Complexity, **47** (2018), 97–109; arXiv:1708.08544v1 [math.NA] 28 Aug 2017.

**161.** "Smooth fixed volume discrepancy, dispersion, and related problems", submitted to Journal Approximation Theory; under name "Dispersion of the Fibonacci and the Frolov point sets", arXiv:1709.08158v2 [math.NA] 4 Oct 2017.

**162.** (with You Gao, Tao Qian, and Long-fei Cao) "Aspects of 2D-Adaptive Fourier Decompositions", arXiv:1710.09277v1 [math.NA] 24 Oct 2017.

**163.** "Fixed volume discrepancy in the periodic case", submitted to Proceedings of the International Conference in Approximation Theory, May 2017, Georgia, USA; arXiv:1710.11499v1 [math.NA] 30 Oct 2017.

**164.** "Remarks on numerical integration, discrepancy, and diaphony", submitted to Foundations of Computational Mathematics; arXiv:1711.07017v1 [math.NA] 19 Nov 2017.

**165.** (joint with A. Dereventsov) "A unified way of analyzing some greedy algorithms", submitted to Journal of Functional Analysis;

**166.** (joint with S. Dilworth, D. Kutzarova, and B. Wallis) "Weight-almost greedy bases", submitted to the volume of Trudy MIAN, dedicated to Konyagin.

**167.** (joint with F. Dai, A. Prymak, S. Tikhonov) Integral norm discretization and related problems, arXiv:1807.01353v1 [math.NA] 3 Jul 2018; submitted to ACHA.

## 12 Invited Conference Addresses

My first International conference was:

1975 – International Conference on Approximation Theory, Kaluga, USSR. Talk : "Best Approximations for Functions of Two Variables".

After that I regularly participated in conferences and workshops on approximation theory and related topics. I list a few most important talks from the period 1975 – 2005 and give a detailed list for the period 2005 – present.

1986 – Semester on Approximation Theory of Stephan Banach International Math. Center, Warsaw, Poland. Talk on the Theory of Widths for Multivariate Approximation.

1987 – International Conference on Approximation and Optimization, Havana, Cuba. Talk on Orthowidths of Classes of Functions With Bounded Mixed Derivative.

1990 – International Conference on Approximation Theory dedicated to N. P. Korneichuk on his 70th birthday, Kiev, USSR. Talk on Best Bilinear Approximations and Applications.

1991 – The Second USA-USSR Conference on Approximation Theory, Leningrad, USSR. Talk on the Fibonacci Cubature Formulas for Classes of Functions With Bounded Mixed Derivative.

1991 – International Conference on Continuous Algorithms and Complexity, Dagstuhl, Germany. Talk on Optimal Cubature Formulas for Classes of Functions With Bounded Mixed Derivative.

1992 – International Conference on Continuous Algorithms and Complexity, Dagstuhl, Germany. Talk on Best Bilinear Approximations and Approximation Numbers of Integral Operators.

1993 – The Second Gauss Congress, section "Computing and Information", Munich, Germany. Talk on Universal Cubature Formulas .

1993 – International Conference on Constructive Approximation, Oberwolfach, Germany. Talk on Universal Methods of Approximation for Anisotropic Sobolev Classes.

1994 – Southeastern Conference in Approximation Theory, Nashville, Tennessee Talk on Trigonometric Hyperbolic Cross Approximation.

1994 – International Conference in Statistics, Alexandria, Virginia Talk on the Role of Approximation and Smoothness Spaces in Compression and Noise Removal.

1995 – International Conference on Continuous Algorithms and Complexity, Park City, Utah. Talk on Nonlinear Methods of Approximation.

1997 – International Conference on Foundations of Computational Mathematics, Rio-de-Janeiro, Brasil. Talk on Nonlinear  $m$ -term approximations.

1999 – Foundations of Computational Mathematics, July 18–28, Oxford, UK, Two talks: on Greedy algorithms (seminary) and on  $\epsilon$ -entropy and volume estimates for multivariate function classes.

1999 – Ideal Data Representation Workshop, October 22–24, AT&T Labs, Plenary talk on Greedy algorithms in nonlinear approximation.

2000 – Multivariate approximation and the entropy numbers (4 one hour talks) in School in Siegmundsburg, Germany, October 19–23.

2000 – Greedy Algorithms in Nonlinear Approximation, SIAM Annual Meeting, Puerto Rico, July 10–14.

2000 – Greedy Algorithms in Nonlinear Approximation (one hour invited talk), AMS meeting, Birmingham, AL, November 10–12.

2001 – Nonlinear Approximation with regard to bases (a plenary talk), 10th International conference on Approximation Theory, St. Louis, Missouri, March 26–29;

2001 – Some remarks on Nonlinear Approximation, International Conference on Approximation and Computation (celebrating the 60<sup>th</sup> birthday of Ron DeVore), Charleston, South Carolina, May 12–17.

2001 – Greedy Algorithms in Nonlinear Approximation (a plenary talk), Amber, Armenia, September 11–18;

2001 – Multivariate numerical integration and related problems, Oberwolfach, Germany, November 18–24;

2002 – Nonlinear  $m$ -term approximation and the entropy numbers, International Conference on Approximation Theory (celebrating the 60<sup>th</sup> birthday of Dany Leviatan), Tel-Aviv, Israel, February 21–25.

2002 – Cubature formulas and Nonlinear Approximation, Algorithms and Complexity for Continuous Problems, Dagstuhl, Germany, September 29 – October 4.

2003 – Nonlinear approximation and numerical integration, Constructive approximation: a meeting honoring Carl de Boor, Dagstuhl, Germany, May 26–30.

2003 – Nonlinear methods in the trigonometric approximation, International conference in harmonic analysis honoring Y. Meyer, R.Coifman, Paris, France, June 16–20.

2004 – Optimal estimators in Learning Theory, International conference on Approximation and Probability dedicated to 70th birthday of Z. Ciesielski, Bedlewo, Poland, September 20–24, 2004.

2004 – Entropy in Learning Theory. Error estimates, International conference on Approximation and Extremal problems dedicated to 70th birthday of V.M. Tikhomirov, Moscow State University, Moscow, Russia, December 16–18.

2005 – On optimal estimators in learning theory , International workshop on learning theory, Toyota Technological Institute, Chicago, May 24.

2005 – Simultaneous Greedy Approximation, International workshop on redundant approximation, Schrödinger Institute, Vienna, Austria, June 23.

2005 – Greedy approximations, International conference on Foundations of Computational Mathematics, Santander, Spain, June 30 – July 9. Plenary talk.

2006 – On Lebesgue type inequalities for greedy approximation, SIAM conference on Imaging Sciences, Minneapolis, May 15–17.

2006 – On optimal estimators in learning theory, Mathematical Foundations of Learning Theory, Paris, France, May 30 – June 4.

2006 – Greedy approximations in Banach spaces, International conference on Functional Analysis dedicated to 60th birthday of N. Kalton, Oxford, Ohio, May 22–28.

2006 – On universality in approximation and learning, Sixth International Conference "Curves and Surfaces", Avignon, France, June 29 – July 5.

2006 – Greedy approximation with regard to bases, ICM, Madrid, Spain, August 22–30.

2006 – The entropy in learning theory, Workshop on Metric Entropy and Applications in Analysis, Learning Theory and Probability, Edinburgh, UK, September 11–15.

2007 – On optimal estimators in learning theory, 13th International conference on Approximation Theory, San Antonio, Texas, March 3–8.

2007 – Greedy algorithms with regard to the trigonometric system, International conference on harmonic analysis (celebrating 80<sup>th</sup> birthday of D. Waterman), Fort-Lauderdale, US, April 30 – May 2.

2007 – Greedy algorithms with regard to the trigonometric system, International conference on harmonic analysis and sparsity, Strobl, Austria, June 17–23.

2007 – Lebesgue type inequalities in greedy approximation, AMS Von Neumann Symposium on Sparse Representations and High Dimensional Geometry, Snowbird, Utah, July 8–12.

2008 – Greedy Approximation, Series of 10 lectures at the Gumilev's University, Astana, Kazakhstan, June 8 –16.

2008 – On universal estimators in learning theory, Learning Theory and Application, Oberwolfach, Germany. June 29 – July 05.

2008 – Greedy Approximation and Applications, Probability and Approximation in Applications, USC, November 22.

2008 – On widths and Compressed Sensing, Dagstuhl, Germany, November 30 – December 5.

2008 – Some progress and open problems in discrepancy theory, Palo-Alto, California, USA, December 8–12.

2009 – Cubature formulas, discrepancy and nonlinear approximation, University of Arkansas, April 16-18.

2009 – Greedy approximation in Banach spaces, Workshop Nonlinear and Adaptive Approximation, Ulm, Germany, September 30 – October 4.

2010 – Super Greedy Algorithms, Workshop on sparsity and compressed sensing, Bonn, Germany, June 7–11.

2011 – Greedy Approximation in Compressed Sensing, International Seminar Series: "New Frontiers in Imaging and Sensing", Columbia, SC, February 17–22.

2011 – Lebesgue type inequalities for greedy approximation, Workshop "Sparse and Low Rank Approximation", Banff, Canada, March 6–11.

2011 – Greedy approximation with respect to bases, International conference "From Abstract to Computational Harmonic Analysis", dedicated to Hans Feichtinger's 60th birthday, Strobl, Austria, June 13–19.

2011 – Lebesgue-type inequalities for greedy approximation with respect to bases, series of 3 talks (50 min each) at the workshop "Greedy Algorithms in Banach Spaces and Compressed Sensing", Texas A& M University, College Station, Texas, July 18–22.

2011 – Lebesgue-type inequalities for greedy approximation with respect to redundant systems, The Informal Regional Functional Analysis Seminar (SUMIRFAS), Texas A& M University, College Station, Texas, July 29–31.

2011 – Greedy approximation with respect to bases, International conference "Harmonic Analysis and Approximations, V", Tsaghadzor, Armenia, September 10–17.

2011 – Greedy approximation in compressed sensing, IMA Annual Program Workshop "High Dimensional Phenomena", Minneapolis, Minnesota, September 26–30.

2011 – Greedy approximation, series of 4 talks (1 hour each) at the workshop "Advanced Course on Approximation Theory", The Centre de Recerca Matematica, Barcelona, Spain, November 7–11.

2012 – Lebesgue-type inequalities for greedy approximation with respect to bases, series of 3 talks (50 min each) at the Institute for Mathematics and its Application, Minneapolis, March.

2012 – Greedy approximation with respect to bases, International conference on harmonic analysis, El Escorial, Spain, June 9 – 16.

2012 – Greedy approximation with respect to redundant systems, International conference on approximation theory, St. Petersburg, Russia, July 30 – August 4.

2012 – Lebesgue-type inequalities for greedy approximation with respect to quasi-greedy bases, IV Congress of Latin American Mathematicians, Argentina, Cordoba, August 6 –10.

2013 – 3 lectures, 1h 20 min each, on Greedy Approximation at New Trends in Applied Harmonic Analysis Sparse Representations, Compressed Sensing and Multifractal Analysis, Mar del Plata, Argentina, August 5 - 16.

2013 – Open problems, Workshop on Discrepancy, Numerical Integration and Hyperbolic Cross Approximation, Hausdorff-Center for Mathematics, University of Bonn, September 23–27, 2013.

2013 – On covering in finite dimensional Banach spaces, Workshop Uniform Distribution Theory and Applications, Oberwolfach, Germany, September 29th - October 5th, 2013.

2014 – Multivariate numerical integration, AMS meeting, Baltimore, January 17, 2014.

2014 – Numerical integration and nonlinear approximation, MCQMC 2014 conference, KU Leuven, Belgium, April 8, 2014.

2014 – Greedy algorithms in compressed sensing. Lebesgue-type inequalities for Chebyshev Greedy Algorithm, 5th International Conference on Computational Harmonic Analysis, Vanderbilt University, May 19–23, 2014.

2014 – From greedy approximation to greedy optimization, Alexandr Pelczynski Memorial conference, Bedlewo, Poland, July 13–19.

2014 – Nonlinear tensor product approximation, Workshop on High-dimensional approximation and optimization, ICERM, Providence, October 3, 2014.

2014 – Greedy sparse approximation in Banach spaces, Workshop on linear algebra, Compressed sensing and optimization, Banff, Canada, October 5–10.

2014 – Greedy Algorithms in convex optimization on Banach spaces, Asilomar conference on Signals, Systems, and Computers, Asilomar, CA, November 2–5, 2014.

2015 – Constructive sparse trigonometric approximation and other problems for functions with mixed smoothness, International conference on function spaces And approximation, dedicated to 60th birthday of W. Sickel, Germany, March 16–20, 2015.

2015 – Sparse approximation with respect to the trigonometric system, International conference on function spaces and approximation theory, dedicated to 110 of S.M. Nikol'skii, Moscow, Russia, May 25–29, 2015.

2015 – Greedy Algorithms in Numerical Integration, Workshop CMO-BIRS on Applied Functional Analysis Oaxaca, Mexico, June 28–July 3, 2015.

2015 – Greedy algorithms in compressed sensing, ISAAC International Congress, Macau, August 2–8, 2015.

2015 – Compressed sensing meets harmonic analysis, Oberwolfach Workshop Applied Harmonic Analysis and Sparse Representations, Germany, August 16–22, 2015.

2016 – Dictionary descent in optimization, Workshop "Harmonic Analysis, Graphs and Learning", Hausdorff Institute in Bonn, March 14–18, 2016.

2016 – The entropy numbers for the mixed smoothness classes, Workshop on function classes and approximation, CRM, Barcelona, Spain, May 2–6, 2016.

2016 – Some lower bounds in numerical integration and recovery, Workshop in Discrepancy Theory, Varenna, Italy, June 12–18, 2016.

2017 – Discretization in Hyperbolic Cross Approximation, Oberwolfach Workshop Multiscale and High-Dimensional Problems, Germany, March 26 – April 1.

2017 – Discretization in Hyperbolic Cross Approximation, International Conference in Approximation Theory, Savannah, Georgia, May 8–11.

2017 – The Marcinkiewicz-type discretization theorems, International Conference in Approximation Theory, Jaen, Spain, July 3–7.

2017 – On the entropy numbers of the mixed smoothness function classes, Foundations of Computational Mathematics, Approximation Theory, Barcelona, July 10–12.

2017 – The Marcinkiewicz-type discretization theorems for the hyperbolic cross polynomials, Foundations of Computational Mathematics, Information Based Complexity, Barcelona, July 17–19.

2017 – Universal discretization, Erwin Schrödinger International Institute for Mathematics and Physics (ESI), ESI-Semester "Tractability of High Dimensional Problems and Discrepancy", September 11–October 13.



2018 – Remarks on numerical integration, discrepancy, and diaphony, International conference "Curves and Surfaces", Arcachon, France, June 30.

2018 – The Marcinkiewicz-type discretization theorems, II International conference "Multiscale Methods and Large-scale Scientific Computing", Moscow, Russia, August 16.